

RESTORATION OF FORESTED WETLANDS ON MARGINAL FARMLAND:
GOALS, STRATEGIES, AND TECHNIQUES

John A. Stanturf

Project Leader, Center for Bottomland Hardwood Research
USDA Forest Service, P.O. Box 227, Stoneville, MS 38776

Callie Jo Schweitzer

Ecologist, Center for Bottomland Hardwood Research
USDA Forest Service, P.O. Box 227, Stoneville, MS 38776

Emile S. Gardiner

Ecophysiologicalist, Center for Bottomland Hardwood Research
USDA Forest Service, P.O. Box 227, Stoneville, MS 38776

James P. Shepard

Wetlands Program Manager, National Council of the Pulp and Paper Industry
for Air and Stream Improvement, Gainesville, FL

INTRODUCTION

The Lower Mississippi Alluvial Valley (LMAV) once supported the largest expanse of forested wetlands in the United States. Rich alluvial soils received periodic sediment additions from the world's third largest river and supported highly productive ecosystems (Putnam et al. 1960, Harris and Gosselink 1990). Bottomland hardwood forests once covered this vast area until flood control and drainage projects encouraged clearing these forests for agriculture (MacDonald et al. 1979). Today, there is a reverse trend toward restoration of these vital ecosystems (Shepard 1995). Public and private restoration programs are driven by the desire to create wildlife habitat and to improve water quality (Stanturf and Schweitzer, In Press). No federal restoration program has a goal to provide financial return to the landowner. Indeed, these programs as currently administered explicitly or implicitly discourage commodity production on restored lands and do not envision any silvicultural manipulation of restored stands beyond the establishment phase. While this lack of a future income stream may be sufficient for public land, we believe it limits the participation of private landowners. In any case, the strategies currently used in restoration programs result in understocked stands that limit future options for shaping stand structure. In this paper we discuss these efforts to convert marginal farmland to bottomland hardwood forests, and present a case for more intensive restoration efforts.

GOALS AND STRATEGIES

Restoration goals are constrained by four factors: landowner objectives, the nature of available sites, technology available, and resources available. The dominant goal of bottomland hardwood restoration programs in the LMAV, on both public and private land, has been to create wildlife habitat. In 1987 the Fish and Wildlife Service began an aggressive restoration program directed at wildlife refuges on public lands but also

including private land. The Corps of Engineers continues to construct flood-control and drainage structures but must now mitigate wetland losses through restoration on other sites. Their mitigation programs are geared toward offsetting losses of fisheries and wildlife habitat. On private forest land, most landowners cite wildlife habitat as a major benefit of ownership. The federal Conservation Reserve Program (CRP) began in 1985 to subsidize establishing permanent cover on erosive and other fragile land such as wetlands, in order to improve water quality. Wildlife habitat creation and water quality improvement are goals of the Wetlands Reserve Program (WRP).

If a landowner primarily desires to create wildlife habitat, the question remains, What kind of habitat? Game species or neotropical songbirds? Species preferring early successional or old-growth forests? Edge or interior species? Even if a landowner omits financial return as a secondary objective, the easiest way to create the desired wildlife habitat may be to thin a young stand. The sale of the thinning could help to offset the cost of cutting, easing the financial burden of management for wildlife. This might make the difference in some ownerships whether the stand is thinned at all, especially on public land where appropriations for management are shrinking.

A landowner's objectives shape what is desired but other factors shape what is feasible. Matching species to site is probably the most important decision that will be made in bottomland hardwood restoration (Baker and Broadfoot 1979; Stanturf et al. In press). A landowner may wish to establish cherrybark oak (*Quercus pagoda*), but it is a poor choice to plant if the site has poorly drained, heavy clay soils. Technology influences feasibility of objectives and largely determines the strategy we choose. Changes in technology brought about by research will almost surely change some of our strategies in the future. Interacting with all these factors is the issue of available resources -- can we afford it? Will planting stock be available? Can we get a good quality planting job done?

The strategies used to restore bottomland hardwood ecosystems cover a spectrum, ranging from extensive to intensive. An extensive strategy has been pursued on public land. It is to seek the lowest cost per acre, and usually involves widely-spaced plantings of heavy-seeded species of value to wildlife for hardmast. This is accomplished using bare-root seedlings or direct-seeding acorns. The idea is to establish those heavy-seeded species such as the oaks that are hardest to establish. These species provide hardmast, and the manager then relies on natural invasion through wind and water dispersal of light-seeded species. The light-seeded species are needed not only to provide diversity but also to fill in the space between the oaks in order to fully occupy the site.

More intensive strategies are available that are more costly. The idea of the intensive strategy is to establish a closed canopy forest sooner, and allow the structure and composition of the future stand to be shaped by direct intervention by the manager. This also provides the potential for income to the landowner. Intensive strategies involve planting more seedlings per acre, or employing more intensive site preparation or subsequent weed control (Stanturf et al. In press). Even more intensive approaches involve establishing multispecies stands. One example is to interplant two or more species such as cottonwood (*Populus deltoides*) and Nuttall oak (*Q. Nuttallii*).

We believe the more intensive strategy will have multiple benefits. In addition to providing future income to the landowner, natural succession and invasion by other species will be accelerated simply by having a closed canopy forest sooner. This will be more attractive and bird and mammal vectors of heavy seeds as well as light seeds. If a closed canopy stand is established sooner, other wetland functions will be restored to levels typical of closed forest, rather than an open beanfield. Future options to manipulate stand structure abound. In the cottonwood and Nuttall oak interplanting, we have the option to harvest all the cottonwood at age 10 in the summer (in order to reduce coppice re-growth, thereby completely releasing the 8-year-old oak

stand); harvest in the winter and encourage another 10-year cottonwood pulpwood rotation from coppice; or partially harvest the cottonwood at age 10, retaining a few individuals for future sawlog or den trees. In any case, the amount of coarse woody debris falling to the forest floor from shed cottonwood limbs in the first 10 years will be tremendous.

TECHNIQUES

Restoration in the lower Mississippi Valley relies on native species planted mostly in single-species plantations of oak at wide spacing, to allow natural invasion of other species. Sites that do not flood frequently, or are more than 100 yards from existing seed sources, may not seed in successfully. We question the appropriateness of this strategy on private land on two counts. First, a more intensive approach would provide a more diverse stand and landscape quicker. This approach is inappropriate if the landowner wants to produce timber. Scant provision has been made on private or public land for future management. Wildlife managers believe the low cost, extensive strategy described above will meet their objectives (Haynes et al 1993). They will have few opportunities, however, for manipulating these understocked stands in the future to further enhance wildlife habitat. Private landowners will find that the stocking that results from federal cost share programs as presently formulated will not be sufficient to support a commercial pulpwood thinning even at age 20 or 30 (J.C. Goelz, USDA Forest Service, Stoneville, MS, personal communication, 1996).

CONCLUSION

The potential for restoration of bottomland hardwood ecosystems to the Lower Mississippi River Valley has barely been tapped. If current funding levels are maintained, close to 200,000 ha could be restored over the next decade. The bulk of this will be on private land enrolled in the Wetlands Reserve Program. All restoration goals can be simplified into one immediate goal -- to re-establish closed canopy bottomland hardwood forests. Although some argue that this is incomplete restoration, all efforts have gone into getting trees into the ground. We have argued that clearer objectives are needed that specify the future stand conditions that are desired. This will allow a more rational choice of strategy and methods that will work.

LITERATURE CITED

- Baker, J.B. and W.M. Broadfoot. 1979. A practical field guide of site evaluation for commercially important hardwoods. USDA Forest Service, Southern Forest Experiment Station General Technical Report SO-26, New Orleans, LA: 51 pp.
- Harris, L.D. and J.G. Gosselink. 1990. Cumulative impacts of bottomland hardwood conversion on wildlife, hydrology, and water quality. In: Gosselink, J.G., L.C. Lee, and T.A. Muir (Editors) Ecological Processes and Cumulative Effects: Illustrated By Bottomland Hardwood Wetland Ecosystems. Lewis Publishers, Chelsea, MI: pp. 259-322.
- Haynes, R.J., R.J. Bridges, S.W. Gard, T.M. Wilkins, and H.R. Cooke, Jr. 1993. Bottomland forest reestablishment efforts of the U.S. Fish and Wildlife Service: Southeast Region. In: Proceedings National Wetlands Engineering Workshop, 3-5 August 1992, St. Louis, MO; US Army Corps of Engineers, Waterways Experiment Station Technical Report WRP-RE-8,

Vicksburg, MS: pp. 322-334.

MacDonald, P.O., W.E. Frayer, and J.K. Clauser. 1979. Documentation, chronology, and future projections of bottomland hardwood habitat losses in the lower Mississippi Alluvial Plain. Vols. 1 and 2. US Fish and Wildlife Service, Washington, DC: 34 pp.

Putnam, J.A., G.M. Furnival, and J.S. McKnight. 1960. Management and inventory of southern hardwoods. USDA Forest Service, Agriculture Handbook 181, Washington, DC: 102 pp.

Shepard, J.P. 1995. Opportunities: Reforesting marginal agricultural land. *Forest Farmer* 54(5):7-9.

Stanturf, J.A. and C.J. Schweitzer. In Press. Restoration goals, strategies, and techniques: A critical view. In: Proceedings of the Delta Conference, 13-15 August 1996, Memphis, TN; US Geological Survey, Biological Resources Division, Lafayette, LA.

Stanturf, J.A., C.J. Schweitzer, and E.S. Gardiner. In Press. Afforestation of marginal agricultural land in the Lower Mississippi River Alluvial Valley, U.S.A. *Silva Fennica*.

SUMMARY

Restoration of bottomland hardwood forests on marginal farmland in the Lower Mississippi Alluvial Valley in the southern United States is being undertaken on a massive scale, supported by various public and private programs. Afforestation in the region relies on using native species, planted mostly in single-species plantations. Choice of species on a site is guided by landowner objectives, species tolerance to flooding, and soils. Current strategies adopted by public programs on both public and private land favors the planting of hardmast-producing species of *Quercus* and *Carya* because of their value to wildlife. Plantings are widely spaced to allow for natural invasion of other species. Wind and water dispersal are relied on to establish light seeded species of *Liquidambar*, *Fraxinus*, *Ulmus*, and *Platanus*. This strategy can be described best as extensive and low-cost. Increasingly, this extensive strategy is questioned on whether more intensive strategies might not yield greater landscape diversity quicker, and whether it is appropriate for a landowner whose objectives include timber production.